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Appl. No. 10/594,784
Amdt. Dated June 22, 2009
Reply to Office Action of March 25, 2009

•••REMARKS/ARGUMENTS•••

The Office Action of march 25, 2009 has been thoroughly studied. Accordingly, the changes presented herein for the claims, considered together with the following remarks, are believed to be sufficient to place the application into condition for allowance.

By the present amendment, independent claim 1 and dependent claim 15 have been changed to delete the recitation of "compression set characteristics."

Technically the recited thiazole-based compound inhibits oxidation degradation of the acrylic elastomer composition. The effect of such degradation is poor compression set characteristics.

Entry of the changes to the claims is respectfully requested.

Claims 1-8, 10, 12 and 14-16 are pending in this application.

Claims 1-8, 10, 12 and 14-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,156,849 to Moriyama et al. in view of JP 61-171737 to Hiramatsu et al. and U.S. Patent No. 5,502,095 to Ueshima et al.

For the reasons set forth below it is submitted that all of the pending claims are allowable over the prior art and therefore, the outstanding rejection of the claims should properly be withdrawn.

Favorable reconsideration by the Examiner is earnestly solicited.

The Examiner has relied upon Moriyama et al. as disclosing:

...an acrylic elastomer composition, which comprises an acrylic elastomer obtained by copolymerization with 0.1 to 10% by weight of fumaric acid mono-lower alkyl

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ester on the basis of total monomer mixture and an aromatic diamine compound vulcanizing agent. It is effectively applicable as a vulcanization molding material for seal members or hose members (abstract). Fumaric acid mono-lower alkyl ester-containing acrylic elastomer can be further copolymerized with other vinyl or olefinic monomer (column 3, lines 9-11). The aromatic diamine compound can be used in an amount of about 0.1 to about 5 parts by weight per 100 parts by weight of the fumaric acid mono-lower alkyl ester-containing acrylic elastomer (column 3, lines 52-56). The acrylic elastomer can be further admixed with a reinforcing agent, a filler, an antioxidant etc, if necessary (column 4, lines 17-21). Its vulcanization molding can be carried out by compression molding, injection molding, transfer molding etc (column 4, lines 28-29). The fumaric acid mono-lower alkyl ester-containing acrylic elastomer can be admixed with an aromatic diamine compound vulcanizing agent (column 3, lines 33-36).

The Examiner concedes that:

Moriyama et al is silent with respect to thiazole-based compound, amine based antioxidant, mixture of amine-based/phenol-based antioxidant and thiazole; amount of thiazole based compound; and the wall thickness of molded-article, such as gasket or o-ring, of not more than 30 mm.

The Examiner has accordingly relied upon Hiramatsu et al. as teaching:

...subjecting elastomer to crosslinking with S or S-containing compounds. The sulfur containing compounds include thiazoles such as mercaptobenzothiazole or dibenzothiazyl disulfide. The cross linked material obtained has low permanent compressive strain and high heat resistance while maintaining excellent workability and moldability characteristic of S-crosslinked material (abstract),

Further the Examiner has relied upon Ueshima et al. as teaching:

...elastomeric composition comprising rubber and has improved flexibility and compression set (abstract). The rubber includes hydrogenated acrylic acid ester-

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butadiene copolymer rubber (column 5, lines 21-26). The compatibility can be further enhanced by introducing functional group such as a carboxyl group (column 5, lines 35-37) which is effected by copolymerizing monomers such as acrylic acid (column 5, lines 40-44). The elastomeric composition can contain additives such as antioxidants in combinations of two or more and includes amine type antioxidants (column 9, lines 62-65), phenol-type antioxidants (column 10, line 17), and imidazole type antioxidants such as zinc salt of 2-mercaptobenzothiazole (column 10, line 14).

In combining the teachings of Moriyama et al., Hiramatsu et al. and Ueshima et al. the Examiner takes the position that;

...it would have been obvious to one skilled in the art at the time invention was made to add thiazole and another antioxidant (amine-based or phenol-based) to the acrylic elastomer composition of Moriyama et al, because Hiramatsu et al teach that thiazoles can be added to elastomeric compositions to improve the compression set while Ueshima et al teach that a combination of two or more antioxidants including amine-type, phenol-type and thiazole antioxidants can be added to elastomeric compositions and one skilled in the art would have been motivated to add thiazole and another antioxidant, based either on phenol or amine, to the elastomeric compositions of Moriyama et al for improving compression set while inhibiting oxidative degradation during the vulcanization process.

"With respect to the amount of Thiazole" the Examiner states:

... while neither reference elucidates that value, it is the examiner's position that thiazole amount is a result-effective variable (MPEP 2144.5) since the amount used clearly affects permanent compressive strain, heat resistance, crosslinking density and oxidative degradation. Hence, the choice of a particular amount of thiazole (such as the amount in present claims) is a matter of routine experimentation and would have been well within the skill level of, and thus obvious to, one of ordinary skill in the art.

"With respect to the wall thickness" the Examiner states:

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... given that the composition, of Moriyama et al in view of Hiramatsu and Ueshima et al, is substantially similar to that of the present claims and the use of vulcanized molding material as a seal member (reads on gaskets or o-rings) is recognized (abstract) by Moriyama et al, it would have been within the scope of a skilled artisan to mold the article to a desired thickness (such as the thickness in present claims) depending on the end use requirements.

The Examiner has relied upon Ueshima et al. as teaching an "elastomeric composition comprising rubber" that has "improved....compression set (abstract)."

Ueshima et al. is directed to improving compression set characteristics in thermoplastic polyester elastomer composition.

In Comparative Example 5 Ueshima et al. tests a composition that does not include a rubber component. More specifically the composition tested in Comparative Example 5 includes 100 parts by weight of thermoplastic polyester elastomer and no NBR.

The compression set of the composition of Comparative Example 5 as shown in Table 2 is 99. This is clearly significantly poor as compared to the other Examples and Comparative Examples, including those that include NBR (whose compression sets range from 70-48).

Ueshima et al. teaches using a rubber component such as a carboxyl group-containing acrylic elastomer for improving compression sets of thermoplastic polyester elastomers.

Ueshima et al. discloses imidazole type antioxidants as specific examples of antioxidants – that are used in the thermoplastic polyester elastomer compositions.

However, Ueshima et al. does not teach or suggest that imidazole type antioxidants have any effect on improving the compression sets of carboxyl group-containing acrylic elastomers.

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Therefore, the Examiner's stated basis for combining the teaching of the prior art:

Hiramatsu et al teach that thiazoles can be added to elastomeric compositions to improve the compression set while Ueshima et al teach that a combination of two or more antioxidants including amine-type, phenol-type and thiazole antioxidants can be added to elastomeric compositions.

fails to realize or appreciate the improvements in compression set that are achieved by applicants' claimed use of carboxyl group-containing acrylic elastomers in combination with imidazole type antioxidants.

Therefore, applicants' claimed invention is not truly "obvious" over the combination of Moriyama et al., Hiramatsu and Ueshima et al.

With regard to applicants' claimed wall thickness, the Examiner has taken the position that "the use of vulcanized molding material as a seal member (reads on gaskets or o-rings) is recognized (abstract) by Moriyama et al, it would have been within the scope of a skilled artisan to mold the article to a desired thickness (such as the thickness in present claims) depending on the end use requirements."

First, it is noted that Moriyama et al. does not teach applicants' claimed wall thicknesses.

Applicants note that thin walled vulcanization-molded articles that, when used, provide a small distance between the surfaces of two articles, such as thin gaskets, O rings, etc. have a strong tendency to deteriorate in their compress set values as discussed in paragraph [0002] of applicants' specification.

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The change of compression set values over time for O rings at 150°C for 600 hours and the effect of the present invention can be appreciated by comparing Example 1 (CS = 54%) to Comparative Example 1 (CS = 60%) or comparing Example 8 (CS = 35%) to Comparative Example 2 (CS = 42%).

As further demonstrated, compression set values are lowered as the added amount of the Thiazole compound increases. (See Examples 1-3)

The compression set values of applicant's O rings are clearly improved when tested at 150°C for 600 hours. These results can be extrapolated (as an accelerated test) to indicate that in actual use the O rings would allow for machine operation for several tens of thousands of hours.

The Examiner has relied upon Hiramatsu et al. as disclosing "subjecting elastomer to crosslinking with S or S-containing compounds. The sulfur containing compounds include thiazoles such as mercaptobenzothiazole or dibenzothiazyl disulfide."

In actuality, Hiramatsu et al. specifically teaches the use of sulfur-based crosslinking followed by radiation with gamma rays to improve compression set characteristics.

Thus, Hiramatsu et al. teaches that the compression sets are not satisfactory absent the gamma radiation treatment.

On page 7 of the Office Action the Examiner has stated that:

...addition of thiazoles of Hiramatsu et al to acrylic elastomer of Moriyama et al is prima facie obvious because the present claims are drawn to an acrylic elastomer composition and the process claims do not require specific conditions for crosslinking.

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Selecting a vulcanization agent is important for cross-linking of acrylic elastomers.

The present invention uses a polyvalent amine compound as a vulcanization agene as does Moriyama et al.

Hiramatsu relies upon primary cross-linking with sulfur-based compounds followed by secondary cross-linking using gamma radiation rays.

Thus, it is noted that the differences in vulcanization agents or cross-linking agents of Moriyama et al. (polyvalent amine compounds) and Hiramatsu (sulfur-based compounds) preclude the teachings of these reference from being combined in any truly obvious manner.

Based upon the above distinctions between the prior art relied upon by the Examiner and the present invention, and the overall teachings of prior art, properly considered as a whole, it is respectfully submitted that the Examiner cannot rely upon the prior art as required under 35 U.S.C. §103 to establish a prima facie case of obviousness of applicants' claimed invention.

It is, therefore, submitted that any reliance upon prior art would be improper inasmuch as the prior art does not remotely anticipate, teach, suggest or render obvious the present invention.

It is submitted that the claims, as now amended, and the discussion contained herein clearly show that the claimed invention is novel and neither anticipated nor obvious over the teachings of the prior art and the outstanding rejection of the claims should hence be withdrawn.

Therefore, reconsideration and withdrawal of the outstanding rejection of the claims and an early allowance of the claims is believed to be in order.

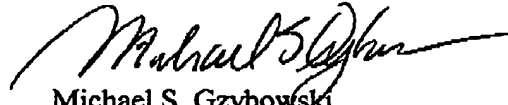
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It is believed that the above represents a complete response to the Official Action and reconsideration is requested.

If upon consideration of the above, the Examiner should feel that there remain outstanding issues in the present application that could be resolved, the Examiner is invited to contact applicant's patent counsel at the telephone number given below to discuss such issues.

To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,


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